

**ENHANCING TRAINING AND COMMUNICATIONS THROUGH VIDEO
CONFERENCING WITHIN THE ORANGE COUNTY FIRE AUTHORITY**

EXECUTIVE DEVELOPMENT

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ABSTRACT

The purpose of this applied research project is to identify the benefits of a video conferencing system in the Orange County Fire Authority. For this project the “action research” method was utilized and the following questions were answered.

- What are the advantages that can be experienced by using a video conferencing system?
- What are the obstacles associated with using video conferencing systems?
- Is video conferencing technology advanced enough to use in the fire service training and communications?
- What video conferencing technology would work best for the fire service?
- What are the costs associated with a video conferencing system?

The procedures used in the research included a computer search for literature in the National Fire Academy Learning Resource Center and on-line search of the California State Long Beach Library. A survey was sent to the Training Officers of Orange County, San Diego County and Los Angeles County Fire Departments. The results of the survey indicated that over 50% of the total population responded positively to having a video conferencing system. Of the 46% who responded, only two other fire departments were actually using video conferencing systems.

The recommendation of this research project is that the Orange County Fire Authority should initiate video conferencing for the OCFA and it's employees.

The Cox/RoseTel solution was chosen as the video conference system because it fits the original goals outlined by the researcher as well as a variety of other uses that include a system that:

- Integrates the large area of the OCFA fire stations
- Delivers two way communication in real time (30 frames per second)
- Is able to work independently of the existing OCFA network
- Is easy to use. No new staff will be needed to run or maintain
- Easily integrates with current training system for scheduling
- Is cost effective and allows the OCFA to start with a small network and expand as needed
- Provides a video conference system to communicate throughout the OCFA during emergency operations

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INTRODUCTION

The Orange County Fire Authority (OCFA) has long recognized the need to provide some form of distance learning for its disbursed workforce. It is a goal of the OCFA Training Staff to provide quality training through proving efficient and effective training programs. Technological advancements in video conferencing systems have made it possible to provide training in a decentralized manner.

The goal of the Orange County Fire Authority Training Staff is to increase efficiency of training and dissemination of information to large numbers of fire personnel throughout Orange County from a centralized location. Furthermore, to enhance overall communication between firehouses by allowing for collaborative meetings between management and field personnel.

The problem is that the Orange County Fire Authority (OCFA) has no way to effectively provide distant learning and communicating with its personnel in a decentralized format. The OCFA jurisdiction spans over 562 square miles. There is not a common cable company or broadcast network that services the County of Orange California. This limits the OCFA from broadcasting over a central cable system to the entire jurisdiction. It has also been determined that a satellite system would be to costly and unreliable.

The OCFA wastes time, money, fuel, maintenance costs and most importantly moves personnel out of their first-in response areas to receive training. There is a very high demand on time for operations fire companies. Many companies are required to drive up to two hours to Fire Headquarters to receive departmental training delivered by the training officers.

Management tries to provide timely information through video newsletters and e-mail, but lacks the two-way, real time capability that video conferencing could provide. This was most evident during the recent attacks on America. The department was at a state of readiness, but the emergency preparedness plan was translated down several levels before the tailboard firefighter who really needed the information received the message. Needless to say, much information was lost in the translations.

The purpose of this applied research project was to answer the following questions using the action research methodology:

- What are the advantages that can be experienced by using a video conferencing system?
- What are the obstacles associated with using video conferencing systems?
- Is video conferencing technology advanced enough to use in the fire service training and communications?
- What video conferencing technology would work best for the fire service?
- What are the costs associated with a video conferencing system?

BACKGROUND AND SIGNIFICANTS

The Orange County Fire Authority (OCFA) is a joint powers authority that serves as the all-risk emergency response agency for 1.3 million Orange County California residence in 22 cities and the unincorporated areas of the county. The OCFA provides fire prevention and suppression, emergency medical service, urban search and rescue assistance and hazardous material response.

During 2000, the Orange County Fire Authority responded 161,241 times to emergencies in its 562-square-mile service area. With some 1600 employees, the OCFA is the largest fire department in Orange County and the forth largest in California.

The Orange County Fire Authority Operations Training and Safety Section is responsible for training 850 career fulltime firefighters and chief officers, plus approximately 500 volunteer reserves. These firefighters and chief officers staff 120 fire engines, 15 aerial truck companies, three airport crash trucks, one hazardous material response team, three water dropping rescue helicopters and 24 additional specialized vehicles. In addition, the OCFA has four expertly trained Urban Search and Rescue teams that make-up USAR Task Force Five. Operations Training is a high priority in the organization. OCFA Firefighters are required to train a minimum of 20 hours per month. Probationary firefighters are required to train 30 hours per month.

Because of the vast number of personnel the OCFA Training and Safety Section has to reach and the spread of over a 562 square-mile-area, video conferencing was selected to research as a solution to providing quality training and departmental communications.

This project was prepared to satisfy the applied research requirements of the National Fire Academy's Executive Fire Officer Program. The problem addressed by this research project relates to Unit 10 of the Executive Development course, titled "Service Quality/Marketing." "Enhancing Training and Communications through Video Conferencing within the Orange County Fire Authority" meets this "Service Quality/Marketing" criteria.

LITERATURE REVIEW

The purpose of this literature review is to summarize the research that has been conducted concerning the use of video conferencing systems. Public sector publications including books, magazines, journals and executive fire officer applied research projects were studied.

First, what are the advantages that can be experienced by using a video conferencing system? Travel costs and stress can be reduced while personal interaction can remain high. More people can be reached with knowledge and information when video conferencing is used in the classroom. Video conferencing can be used very effectively for meetings and classes. According to Bruce Betts, San Juan Capistrano Research Institute, "By removing the need for either the content provider or the students to travel, yet still providing a two-way audio AND video link, you're providing educational opportunities for interactions that would not otherwise exist."

Facilitating attendance at meetings is one of the simplest yet most popular uses of video conferencing. For meetings that already regularly take place and require face-to-face communication, video conferencing can substitute for the actual physical presence of remote participants. This reduces travel costs as well as travel time and makes meeting attendance more convenient. It can also make meetings more likely to occur. Frequent and/or ad hoc meetings that might not have been scheduled due to travel costs and timing can be enabled via video conferencing and enhance the sense of teamwork among people at different locations but working on the same project.

Video conferencing provides remote participants with much of the face-to-face familiarity that comes with physical presence, including elements of facial expression,

body language, and eye contact. According to Paul Massmann, Concordia University Irvine "Students see themselves on screen and realize that is how others see them. Over the course of the semester I have seen dress change, posture change, poise change, all for the positive."

Second, what are the obstacles associated with using video conferencing systems? As with any technology, interactive video has its limitations:

- The initial cost of the equipment and leasing the lines to transmit conferences may be prohibitive.
- Companies which produce codecs have each developed unique methods of compression which are incompatible, although protocols have been established to allow communication among brand names. However, this “universal standard” compromises resolution and quality to a certain degree.
- Unless a strong effort is made by the instructor, students not located with the instructor may remain uninvolved in the course.
- If visuals, like handwritten or copied materials, are not properly prepared, students may have a difficult time reading them.
- If the “pipe” that carries the transmission among sites is not large enough, the students may observe “ghost images” when rapid movement occurs in “real time” (Reed and Woodruff, 1995).
- If the system is not properly configured, class members may observe an audio “echo” effect (Reed and Woodruff, 1995). The result is audio interference that detracts from the learning environment.

Third, is video conferencing technology advanced enough to use in the fire service training and communications? According to Bruce, Vernon (1996) users of video conferencing are all, in comparison with telecommunication and face to face interactions, inexperienced. It may be that the answer is merely a question of establishing new communicative strategies for the use of video conferencing. Video conferencing is in no way a failure. Video conferencing completes the tasks set for it as well as any existing telecommunications system. Given a little more time on the same task it completes the task just as well as face to face communicators. But given its supposed potential of eliminating face to face communication, it still has some way to go before that goal is fully achieved.

Bandwidth Blues – The quality of video meeting and classes varies because of bandwidth. At this point, the bandwidth, not the video conference technology is the greatest obstacle. “It’s a last mile problem. The barrier to the consumer is the network” (Davis 2001). Corporations can achieve reliable quality video conferencing by choosing and building their own networks using ISDN (Integrated Services Digital Network) lines.

Fourth, what video conferencing technology would work best for fire service use? Interactive Videoconferencing (IV) is an effective tool that may be used in distance education settings. This system can be integrated into the distance education program with minimal adaptation to the curriculum and course and is designed to support two-way video and audio communication between multiple locations. (College of Engineering, University of Idaho, 2001) Video Conferencing should appeal to businesses in a weak economy, because they save money for companies whose employees travel often to meeting and classes proponents argue (Davis 2001).

As with any new technology, successful integration of video conferencing into existing activities requires attention to the needs of the people who will be using it. The determination of what is acceptable and useful must be based on the reaction and comfort level of the end users. In the case of simple point-to-point meetings, there is not a lot of new learning required for participants to successfully interact with each other as long as the video and audio quality do not interfere. Care should be taken to ensure that participants feel they can see and hear each other clearly. (Engineering Outreach, University of Idaho)

Finally, what are the costs associated with a video conferencing system? Several Southern states run their own statewide telemedicine system linking hospitals, rural clinics, prisons, nursing homes, and more. These systems have proven to be cost-effective, even though the equipment cost per site has traditionally been more than \$100,000. Using new H.323 videoconferencing systems may lower the costs significantly for use in this application, allowing for widespread deployment in more rural and urban areas. Video-over-IP, ASPs, and lower prices will push video conferencing into to mainstream.

In general, Davis (2001) concluded that a combination of audio, video, and data conferencing is a feasible alternative, in terms of cost, quality, and effectiveness. He doesn't feel the technology yet provides an ideal solution in any of these areas, but believes it provides an adequate one. Davis feels he has proven that video conferencing can be an effectively and affordably system.

"Basically, you can pay for a video conferencing system in a few weeks in some cases" (Davis 2001). Most businesses that do use video conferencing aren't trying to

save money, but rather time. Meetings and classes over video systems tend to be shorter and more focused than face to face gatherings.

PROCEDURES

To begin the research for this project, a computer search was performed at the National Fire Academy's Learning Resource Center during the period of June 28 through June 29, 2001. The search was intended to gather information related to the use of video conferencing in the fire service. The research procedures used in this report included a literature review and interviews search to examine the mentoring process within the fire service and in the public and private sector. Additionally, a feedback instrument (Appendix A) was utilized to elicit information regarding the current use of two-way video conferencing systems in various fire departments around the Orange County, Los Angeles County and San Diego County.

Literature Search

The researcher reviewed fire service and relevant private sector literature, including previous applied research papers, journal articles, magazines, and books. Bibliographies of the few EFO applied research projects found on the subject of two-way television, satellite and video conferencing were used to find additional source materials, as was the City of Orange Public Library. An Internet search yielded some information, although it was difficult to find many relevant fire service sources.

Information Collection

The information on local use of video conferencing was gathered utilizing a feedback instrument that was developed and disseminated. Fifty feedback instruments

were sent to the local fire departments in the Orange County, Los Angeles and San Diego Areas.

The rationale for choosing these fire departments for the study was to determine what local cable companies could provide and from the research it had been determined that San Diego City had a system in place. Los Angeles and San Diego have the same geographical challenges experienced with in the Orange County Fire Authority.

The feedback instrument was mailed in November 2001 and respondents were asked to respond within 14 days. A self-addressed, stamped return envelope was included along with contact information should the respondent need clarification of any portion of the instrument.

The first section described the purpose and background of the feedback instrument. It also provided direction on completing and returning the feedback instrument. The second part of the feedback instrument included the demographic portion, which asked for department name, contact person, and number of uniformed firefighters. This was done intentionally so that the researcher could contact the respondents with any follow up questions. The third portion dealt with video conferencing data and utilized the forced-choice methodology to obtain information regarding the presence of video conferencing systems.

Assumptions and limitations

The study contains several assumptions and limiting factors. First, the researcher assumed that the respondents answered all questions accurately and completely and were qualified and knowledgeable in the subject matter requested. Second, video conferencing in the fire service has not been extensively researched consequently this limited the

amount of resources available for the study and required more research in the private sector.

Video Conferencing Definitions of Terms

(See Appendix B)

RESULTS

Research Question 1. What are the advantages that can be experienced by using a video conferencing system? The researcher found that video conferencing will allow for decentralized training and enhanced communications for management.

Research Question 2. What are the obstacles associated with using video conferencing systems? The researcher found that there are many obstacles to overcome. Most of the obstacles related to non face to face communications. Specialized training in video conferencing communications can help to overcome the obstacles. Broadband width was the other biggest obstacle. The solution was to purchase the adequate band width from the beginning.

Research Question 3. Is video conferencing technology advanced enough to use for fire service training and communications? The researcher found that there are sufficient technology advances for video conferencing to be successful in fire service training and communications.

Research Question 4. What type of video conferencing technology would work best for fire service use? The researcher found that a system that would work best would integrate the large area of the OCFA fire stations should deliver two way communications in real time (30 frames per second-real time video). Work independently of the existing OCFA network. Be easy to use (direct dial up like a phone). Be cost effective and allow the OCFA

to start with a small network and expand as needed. Allow for unlimited usage by the OCFA. Provide monitoring seven days per week, 24 hours a day. Require no additional staff to operate. Be capable of integrating teaching equipment currently used by the OCFA (VCR, DVD, computers and video cameras).

Research Question 5. What are the costs associated with video conferencing systems? There are two main components of cost as they relate to the video conferencing system. Fixed one-time costs for equipment and installation and monthly recurring costs tied to usage and connectivity.

A total of 23 feedback instruments were returned out of 50, reflecting a 46% response. Results of the feedback instrument confirmed:

1. Does your department use video conferencing, two-way cable television or satellite for training and department communications? Please Circle: YES (14), NO (9)
2. If no, have you ever considered using this kind of technology for training and communications? Please Circle: YES (7) NO (2)
3. If your department does have a system, what type of system does your department use? Please Circle: Video Conferencing (2) Two-way cable television (9) Satellite (3)
4. How would you rate the effectiveness of training and communications using this type of technology? Circle One: Excellent (2), Good (9), Fair (2), Poor (1)
5. How is the interaction with the instructor and students is? Circle One: Excellent (4), Good (8), Fair (1), Poor (1)
6. Has the cost benefits of your system exceeded the start-up cost of the system?

Feedback instruments indicated less overtime costs for training and fuel cost savings.

7. What obstacles have you encountered with your system? Feedback instruments indicated equipment and system/network problems. It was also noted that face to face or personal instruction was an obstacle to overcome.

Only seven respondents provided additional comments. Twenty respondents indicated that they would like a copy of the research report when completed.

DISCUSSION

When compared to results of the literature review, the results of this project support the need to implement a videoconferencing system within the Orange County Fire Authority for training and communications. The vast area of 562 square miles and the need to deliver training to 1300 plus suppression forces requires that a decentralized system be implemented. The literature review consistently established the advances in video conferencing technology, cost effectiveness, and training and communication benefits. The cost benefit discussion should prove that this type of system will pay for itself in reduction of travel time, fuel costs, apparatus maintenance and most importantly reduction of personnel out of service for training.

The next greatest obstacle outside of the financial impact that faces the fire service use of videoconferencing is a reeducation of both the instructor and the student. Courses need to be designed to elicit interaction without being disruptive. The instructor needs to present material in a planned and focused manner. The student needs to become involved and open to accept this new form of instruction.

Advances in the videoconferencing systems technology are occurring on a daily basis. Through the use of T-1 lines and advances in software development have greatly

enhanced the ability of a videoconferencing system to deliver high quality training and communications.

RECOMMENDATIONS

This research project recommends the Orange County Fire Authority implement a video conferencing system. This video conferencing system should be installed at 10 locations throughout the OCFA jurisdiction.

It is the recommendation of the researcher that a WAN (Wide Area Network) system provided by Cox/RoseTel be chosen as the video conference system because it best mirrors the recommendations found in the literature review. The Orange County Fire Authority should consider the following when implementing a video conferencing system:

- Integrates a large area of the OCFA fire stations by placing the systems in (10) locations
- Cox/RoseTel delivers two way communications in real time (30 frames per second)
- Install the system to run independent of the existing OCFA computer network
- Train the Operations Training and Safety Staff to administer the system
- Allows for expandability of the network as needed
- Allow unlimited usage of the system to OCFA personnel
- Includes all maintenance, software upgrades, and training provided by Cox/Rose Tel without additional charge.

In December 2001, (Appendix C) is a proposal that was written and submitted by the researcher to the Orange County Fire Authority Executive Management. Executive Management has tentatively approved the concept of implementing a video conferencing system. Orange County government code requires us to receive additional bids on

purchases over fifty thousand-dollar. We are currently exploring other systems per the County code.

The information included in this research project illustrates the benefits for implementing a video conferencing system. Implementation of video conferencing system will result in a cost savings. An added value, over and above the cost factor is the enhanced training opportunities and department communications.

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APPENDIX A

Orange County Fire Authority Video Conferencing Survey

This is a feedback instrument intended to gather information on the use of video conferencing, two-way cable television, and satellite in your fire departments. The Orange County Fire Authority is researching the feasibility of implementing a video conferencing system. Your feedback is very important! Please take a moment to complete this form. I have enclosed a postage-paid envelope for your convenience. My card is enclosed should you have any questions or comments. Please return this survey by November 27, 2001.

Department Name _____

Training Officer _____

Number of Uniformed Firefighters _____

1. Does your department use video conferencing, two-way cable television or satellite for training and department communications? Please Circle: YES NO
2. Have you ever considered using this kind of technology for training and communications? Please Circle: YES NO
3. If your department does have a system, what type of system does your department use? Please Circle: Video Conferencing Two-way cable television Satellite
4. How would you rate the effectiveness of training and communications using this type of technology? Circle One: Excellent Good Fair Poor
5. How is the interaction with the instructor and students is?
Circle One: Excellent Good Fair Poor
6. Has the cost benefits of your system exceeded the start-up cost of the system?
7. What obstacles have you encountered with your video conferencing system?

Additional comments:

Thank you for your participation. Please indicate if you would like a copy of the research report when completed? Circle One: YES NO

APPENDIX B

VIDEO CONFERENCING DEFINITION OF TERMS

A

antialiasing

A method for smoothing the jagged edges (stairsteps) often seen in graphics or video. The method reduces the jagged edges by placing intermediate shades of color or gray around the steps.

ASF

Active Streaming Format. A Microsoft file format for digital video playback over the Internet, or on a standalone computer. Kind of a wrapper around any of a number of compression types, including MPEG. Part of Netshow, a proprietary streaming media solution from Microsoft. Biggest competitor is Real Networks. While this 'wrapper' support many standard formats, ASF files are themselves proprietary.

AVI

Audio Video Interleaved. A Microsoft format for digital audio and video playback from Windows 3.1 Somewhat cross-platform, but mostly a Windows format. Has been replaced by the ASF format, but still used by some multimedia developers.

B

banding

The presence of extraneous lines.

bandwidth

A measure of the amount of data that can fit on a network. Measured in Hertz or bits per second. For example, a regular Ethernet line has a bandwidth of 10 Mbps (10 million bits per second)

bit rate

The speed of a communication channel, usually used when referring to modems. Most new modems follow the V.90 standard, which has a bit rate of 56kbps (56,000 bits per second)

C

CIF

A video format that supports both NTSC and PAL signals. CIF is part of the ITU H.261 videoconferencing standard. It specifies a data rate of 30 frames per second (fps), with each frame containing 288 lines and 352 pixels per line.

CODEC

Stands for Coder/Decoder (a telecommunications term) or Compressor/Decompressor (a computer term). A telecom codec is the piece of hardware that connects a data line to the customer's local network. In the computer world, a codec is a piece of software that compresses and decompresses digital audio or video.

chrominance

color

D

decoder

A piece of hardware or software that is used to convert video or audio (typically) from the digital form used in transmission or storage into a form that can be viewed.

digital audio

Audio that has been encoded in a digital form for processing, storage or transmission.

dithering

Giving the illusion of new color and shades by combining dots in various patterns. This is a common way of gaining gray scales and is commonly used in newspapers. The effects of dithering would not be optimal in the video produced during a videoconference.

F

full duplex

Sending data in both directions at the same time. Usually higher quality, but requires more bandwidth. In video conferencing, full duplex will be much more natural and useable. Cheap speakerphones are half duplex, whereas more expensive ones are full duplex.

G

G.7xx

A family of ITU standards for audio compression.

gatekeeper

In the H.323 world, the gatekeeper provides several important functions. First, it controls access to the network, allowing or denying calls and controlling the bandwidth of a call. Second, it helps with address resolution, making possible email type names for end users, and converting those into the appropriate network addresses. They also handle call tracking and billing, call signaling, and the management of gateways. They also handle call tracking and billing, call signaling, and the management of gateways.

gateway

Gateways provide a link between the H.323 world and other video conferencing systems. A common example would be a gateway to a H.320 (ISDN) video conferencing system.

H

H.261

ITU standard for video coding for videoconferencing. H.261 is a discrete cosine transform (DCT) based algorithm for video in the 64kb/s to 2mb/s range. All H.323 compliant video conferencing system are required to support this codec.

H.263

ITU standard for video coding within videoconferencing. H.263 offers better compression than H.261, particularly in the low bitrate range used by modems.

H.320

ITU standard for videoconferencing over ISDN and fractional T1 lines.

H.323

ITU standard for videoconferencing over networks that do not guarantee bandwidth, such as the Internet. H.323 is the standard that this cookbook is recommending that most users in the education community should be using. For more detailed information on this and the other ITU standards see the bibliography of this document.

H.324

ITU standard for video conferencing over standard phone lines.

half duplex

A telecommunications system where data can only flow in one direction at a time. Cheaper speakerphones are a good example of this, where only one person can talk at a time.

I**IETF**

Internet Engineering Task Force. This is a group that develops and publishes new standards for use on the Internet.

IGMP

Internet Group Management Protocol. This protocol is used in multicasting.

IP

The Internet Protocol. IP is the basic language of the Internet. It was developed by the government for use in internetworking multiple computer networks together.

IP Multicast

A system for sending IP transmissions out only one time, but allowing for multiple users to receive it. This would reduce the bandwidth required for audio and video broadcasting over the Internet, but it is not widely used yet.

J**jitter**

A flickering on a display screen. Besides a monitor or connector malfunction, jitter can be caused by a slow refresh rate.

K**Kerberos**

Kerberos is a network authentication protocol developed by MIT. It is designed to provide strong authentication for client/server applications by using secret-key cryptography.

L

latency

The length of time it takes a packet to move from source to destination; delay.

lossless compression

Refers to data compression techniques in which no data is lost. For most types of data, lossless compression techniques can reduce the space needed by only about half. Only certain types of data can tolerate lossy compression. Lossless compression technique when compressing data and programs.

lossy compression

Refers to data compression techniques in which some amount of data is lost. Lossy compression technologies attempt to eliminate redundant or unnecessary information. Most video compression technologies, such as MPEG, use a lossy technique.

luminance

brightness

M

MBONE

Multicast Backbone. The MBONE is a system of transmitting audio and video over a multicast network. Mostly available at universities and government facilities, the MBONE can be thought of as a testbed for technologies that will eventually be promulgated across the larger internet. The MBONE has been replaced on the vBNS and Abilene by native multicast support.

MIDI

Musical Instrument Digital Interface is a standard for connecting electronic musical instruments and computers. MIDI files can be thought of as digital sheet music, where the computer acts as the musician playing back the file. MIDI files are much smaller than digital audio files, but the quality of playback will vary from computer to computer.

MPEG

MPEG (Moving Picture Experts Group) is a series of ISO standards for digital video and audio, designed for different uses and data rates.

MPEG-1 - The initial MPEG standard, designed to encode full motion video so it could be played back off of a CD (150 kb/s). The bit rate of a standard MPEG1 is 1.5Mbps. MPEG-1 has a frame size of 352x240 pixels, which gives a picture quality slightly better than VHS video tape. MPEG-1 included three audio standards, most video systems use MPEG-1 layer 1 or layer 2 audio. MPEG-1 layer 3 audio (commonly known as MP3), is being used widely for audio on the Internet.

MPEG-2 was a follow-on standard supporting higher data rates, and thus higher quality. MPEG-2 is the standard used in DVD video players, most digital satellite systems in North America, and in the new North American Digital TV system.

MPEG-3 was abandoned as its planned functionality was included in MPEG-2.

MPEG-4 is a draft standard that will be better suited for use on the Internet. MPEG4 delivers video at comparable quality to MPEG1 at a much lower bit rate. MPEG-4 also supports a wide variety of elements that can be transmitted separately and combined to form the video frame, such as a talking head in one stream and the background in another. That is, MPEG4 allows manipulation of objects within the video stream (addition, subtraction, object manipulation, etc.). If you don't like where a chair is in the video, you can move it (providing the chair has been coded as a moveable object, of course). Approval is expected in the first half of 1999.

MPEG-7 is a developing standard for the description of multimedia objects. Not a video encoding format, it is a way to describe elements in a multimedia stream so that they can be accessed via database. For example, it would be useful to be able to search a multimedia database for instances of 'red wagons.'

Multipoint Conferencing Server (MCS) (also MCU)

A hardware or software H.323 device that allows multiple video conferencing (or audio or data) users to connect together. Without an MCS typically only point to point conferences can take place. Commonly supports voice activated switching, where whoever is talking is broadcast to all users, but new systems support "Hollywood squares", where multiple windows show each participant. ITU-T standard H.231 describes the standard way of doing this. Many current systems only support H.320 (ISDN) but many vendors are working to upgrade their products to support H.323 (LAN, Internet) as well. In the H.320 space, this functionality is referred to as a multipoint control unit (MCU). Sometimes these terms are used interchangeably, although they refer to somewhat different implementations.

P

packet

A unit of information sent across a (packet-switched) network. A packet generally contains the destination address as well as the data to be sent.

Q

QCIF

A standard related to CIF, QCIF (Quarter CIF), transfers one fourth the amount of data and is suitable for videoconferencing systems on slower connections or telephone lines.

QuickTime

A file-format and architecture developed by Apple for use with digital audio and video. Available on most computing platforms. A future version (Quicktime3) will support streaming.

R

RealAudio

A proprietary system for streaming audio (and now video) over the internet. Before Real Audio, users had to download an entire audio file before they could listen to it. Also supports real-time broadcast of audio and video programs. Many radio stations now broadcast on the internet using Real Audio.

real time

A transmission that occurs right away, without any perceptible delay. Very important in video conferencing, as much delay will make the system very unusable.

S

streaming media

Sending video or audio over a network as needed, such as Real Audio/Video or Microsoft NetShow, instead of forcing the user to download the entire file before viewing it. Typically a few seconds of data is sent ahead and buffered in case of network transmission delays. (Although some data is buffered to the hard drive, it is written to temporary storage and is gone once viewing is complete.)

T

T.120

T.120 is an ITU-T standard (International Telecommunications Union) for document conferencing. Document conferencing allows two or more people to concurrently view and edit a document across a network.

T.120 is the commonly used name to refer to a family of distinct standards. Many video conferencing companies were developing their own implementations of this until Microsoft released its free NetMeeting software. Now, many companies are using NetMeeting, while perhaps enhancing it in some way.

Teleconferencing

Two or more people who are geographically distant having a meeting of some sort across a telecommunications link. Includes audio conferencing, video conferencing, and or data conferencing.

Terminal End Station

A terminal end station is the client endpoint that provides real-time, two-way communications. This is often shortened to just terminal.

Transcoder

A device that does transcoding. See below.

Transcoding

Converting a data stream from one format to another, such as MPEG 1 to H.263, or an H.320 videoconferencing session to H.323.

Truespeech

Truespeech is a codec used for low bandwidth encoding of speech (not music). It was created by the DSP Group. It is available on Microsoft Windows 98 among other systems.

U

unicast

Sending each user their own copy of a video (or other data) stream. As opposed to Multicast, where one copy is sent and whoever wants it listens to that copy. It is the most commonly used method for video conferencing and video on demand today. Multicast, which is much more efficient, is slowly gaining ground, but requires Internet Service Providers to support it.

V

ViDe

Video Development Group. Currently consists of the Georgia Institute of Technology, North Carolina State University, the University of North Carolina, Chapel Hill, and the University of Tennessee, Knoxville, in partnership with NYSERNet (New York State Education, Research Network).

video on demand

Being able to view any of a number of videos when you want to. Used on the internet and at hotels, cable systems, etc.

video server

A computer server that has been designed to store large amounts of video and stream it to users as required. Usually a video server has large amounts of high speed disks and a large amount of network bandwidth to allow for many users to simultaneously view videos.

voice activated switching

Automatically switching the video feed to whomever is speaking in a multipoint video conference. Usually a function of the MCU (multipoint conferencing unit)

APPENDIX C

Proposal for Videophone Services

Prepared by:

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Operations Training and Safety Section

December, 2001

EXECUTIVE SUMMARY

The Orange County Fire Authority needs to develop a distance training solution that could be used by its staff countywide. The ultimate goal of this project is to increase efficiency of training and dissemination of information to large numbers of fire personnel throughout the county from a centralized location. Furthermore, it should enhance overall communication between firehouses by allowing for collaborative meetings between management and field personnel.

By obtaining a distance learning system the OCFA will save money, fuel and maintenance costs and most importantly allow personnel to receive quality training while allowing units to stay close to their role area. Day to day operations communications can be accomplished without the inconvenience or time constraints of having to travel to Headquarter. It will also decrease the workload on the Training Section Staff and maximize the use of training hours within the OCFA.

The training section has come up with what it feels is the best solution to meet our distant learning needs after looking at a variety of options. A video conference system that will:

- Integrate the large area of the OCFA fire stations
- Deliver two way communication in real time (30 frames per second)
- Work independently of the existing OCFA network
- Be easy to use
- Be cost effective
- Allow for unlimited usage by the OCFA
- Be maintained 24/7
- Save money on fuel and maintenance cost of its vehicle
- Allow the OCFA to use current technology to its advantage
- Fully integrates with the teaching tools currently used (computer, VCR, video cameras and DVD)

The best use of a video conference system would be to place one system per battalion, a system in ECC and one in the Training classroom for a total of ten.

To implement the system there would be two sets of costs. The first cost is a one time equipment and installation charge of \$93,850.00. The second is a monthly reoccurring cost of \$7611.04. The above monthly reoccurring cost would be covered under the current contract that the OCFA has with Santa Ana College. Because of the advantages listed above the Operations Training section believes a video conference system provided by RoseTel/Cox Communications would best meet the needs of the OCFA.

INTRODUCTION

For the past several months, the Operations Training and Safety section has been working to develop a distance training solution for its staff countywide.

This proposal will offer several ways the Fire Authority can reduce operating expenses and improve the high standards of training and community services. The opportunities outlined in this proposal will help the Fire Authority meet our key training and outreach objectives of the coming year and beyond.

BACKGROUND

The process of researching better ways to deliver training has taken almost one year. Our first step was to define our goals to improve the quality and quantity of training provided to field personnel:

- Identify possible technology solutions to help the OCFA in our training needs
- Identify alternative methods of delivering training to OCFA personnel while keeping units in their Stations or Battalions
- Identify distance learning possibilities
- Reduce driving times to training locations
- Increase communication throughout the department
- Identify a cost effective way to deliver training
- Identify a better way to use training section manpower

The decision was made that a videoconference system would best fit the OCFA training needs. The system should have the ability to:

- Integrate the large area of the OCFA fire stations
- Deliver two way communication in real time (30 frames per second-Real Time video)
- Work independently of the existing OCFA network
- Be easy to use (direct dial up like a phone)
- Be cost effective and allow the OCFA to start with a small network and expand as needed
- Allow for unlimited usage by the OCFA
- Be maintained 24/7
- Require no additional staff to operate
- Integrate teaching equipment currently used by the OCFA (VCR, DVD, computers and video cameras)
- Incur no maintenance costs

After looking at multiple videoconference systems and meeting with different companies, it was decided that Cox Communications RoseTel system best fit the needs of the OCFA. A meeting was scheduled with Cox Communications and those in attendance included:

From the Orange County Fire Authority:

Bill Dean, Assistant Chief
 Buck Henderson, Division Chief
 Michael Moore, Battalion Chief
 Roger Stites, Information Systems
 Michael Contreras, Assistant Fire Training Officer
 Kevin Pedersen, Corporate Communications

From Cox Communications:

David Montierth, Vice President and General Manager
 Todd Spooner, Director of Sales
 Aras Mardosa, Senior Systems Engineer
 Jon Dunning, Market Account Executive

During the demonstration, all in attendance were able to see the variety of applications the Cox/RoseTel system has to offer:

- Full duplex communications at 30 frames per second (Real Time)
- A teaching demonstration using Power Point and video while being able to speak and answer questions simultaneously
- A Tele-conference conducted with a location in San Diego County; including multiple sites

After the demonstration, other applications of the system were discussed that included:

- The use of the video conference system to communicate throughout the OCFA during emergency operations
- The ability to communicate with other agencies, including Police and Fire other agencies for cross system training and coordination outside the OCFA, that are equipped with a video conference system

PROPOSAL

In response to the specific needs and issues of the Orange County Fire Authority, the Operations Training and Safety Section proposes the following solution:

The equipment needed at each location is as follows. The setup and equipment issues are identical (locations that currently have a 27 inch TV will not need to purchase a TV included in the plan). Each location will have a complete RoseTel WAN system station that includes the following items:

RoseTel WAN station:*Rose Tel Codec with IR Sensor/Emitter**27" Monitor W/2-Tuner PIP & Remote**Rose Tel Pan/Tilt/ Zoom Video Camera w/ remote**Rose Tel Microphone- Echo Cancellation Module**Rose Tel Premium Single Station Cable Package*

We feel the best solution for the OCFA is a 10 location roll out (one system per battalion, one system in ECC and one system in the Operations Training classroom) at the following locations

10 location Roll out

- | | |
|-----------------------|--|
| 1. OCFA Headquarters: | 145 S. Water St., Orange |
| 2. Fire Station #61: | 8081 Western, Buena Park |
| 3. Fire Station #22: | 24001 Paseo De Valencia, Laguna Hills |
| 4. Fire Station #5: | 23600 Pacific Island Dr, Laguna Niguel |
| 5. Fire Station #6: | 3180 Barranca Pkwy, Irvine |
| 6. Fire Station #64: | 7351 Westminster Blvd, Westminster |
| 7. Fire Station #34: | 1530 N. Valencia Ave, Placentia |
| 8. Fire Station #43: | 11490 Pioneer Way, Tustin |
| 9. Fire Station #45: | 30131 Aventura, Rancho Santa Margarita |
| 10. HQ – ECC: | 180 South Water St., Orange |

COST

There are two main components of cost as they relate to the RoseTel videophone system

- Fixed one-time costs for equipment and installation
- Monthly recurring costs tied to usage and connectivity

The two components are broken down as follows:

One-Time Costs:

Equipment – Complete RoseTel WAN station (see above)	\$8635
T-1 circuit installation per location	<u>\$ 750</u>
	<i>\$9385 per location</i>

Monthly Recurring Costs:

These charges are for—usage and connectivity. The usage will always remain \$350/month flat rate per location. The connectivity (T-1 used only for video conference system) is priced based on a distance model. The following is the total recurring costs for each of the scenarios we have outlined above:

Ten Locations Roll out

\$7611.04 monthly for life of contract

The one time cost and monthly recurring cost will be covered by the Training Sections Trust Fund. Because this system is fully interactive and real time we will be able to bill Santa Ana College for ADA funds (we are paid \$2.50 cents for every documented hour of training). Under the current contract we would need to use the system four hours per month to recoup the monthly cost.

BENEFIT

The strength of this product speaks for itself when looking at the quality of the service offered. With RoseTel we will be getting full 30-frames per second, no latency video conferencing/video phone system. With Cox backing this product, we have the peace of mind that a leader in customer support backs our system and service, should we need them. The RoseTel/Cox network is monitored 24/7, with a triple redundancy system that is designed to keep our system working, eliminating concerns about the systems reliability. If a problem does arise, we just call Cox and a technician will come to our location and trouble shoot the system so the problem can be fixed. Once the problem has been identified, all resources of RoseTel/Cox will work to fix the problem.

The ease of use is probably one of the most attractive features of the video conference system. If you can dial a phone you can use the video conference system. Each of our stations will be assigned a unique RoseTel videophone number, which will be used to make and receive calls to other stations. The connection is as seamless as a standard telephone call with the huge benefit of having a real-time face to face interface to conduct training or meetings.

Time and travel savings alone should justify the need and use of the system on a regular basis. Customers have said that they end up using the system on a daily basis for impromptu meetings and collaboration that never would have taken place otherwise. It will allow you to have a “local” presence at any of our facilities with a simple phone call.

Recommendation

It is the recommendation of the Operations Training and Safety section that the Cox/RoseTel solution be chosen as the video conference system because it fits the original goals outlined by the Training and Safety section as well as a variety of other uses that include a system that:

- Integrates the large area of the OCFA fire stations
- Delivers two way communication in real time (30 frames per second)
- Is able to work independently of the existing OCFA network
- Is easy to use. No new staff will be needed to run or maintain
- Easily integrates with current training system for scheduling
- Is cost effective and allows the OCFA to start with a small network and expand as needed
- Provides a video conference system to communicate throughout the OCFA during emergency operations

- Allows for communication with other agencies outside the OCFA that have a video conference system
- Allows unlimited usage by the OCFA
- Includes all maintenance, software upgrades, and training provided by Cox/Rose Tel without additional charge.

Proposed Implementation

When the Orange County Fire Authority accepts this proposal, Cox will begin this action plan to implement the service with Cox Business Services:

- Sign Agreements
- Place order for T-1 data connections
- Coordinate installation with Cox local Operations department
- Coordinate vendor meeting (if needed)
- Install service
- Test service
- Review/follow up with success of system

Timeframes for installation will generally be 30-45 days for the T-1 circuits. RoseTel equipment will be delivered, installed, and online by a specified date for T-1 testing purposes. RoseTel and/or Cox personnel will provide training at designated locations after the circuit has been lit, and will consist of:

- How to place a video call
- How to initiate a quad (4-way) conference
- How to operate cameras and remotes
- How to end a video call

The Orange County Fire Authority's order will be personally monitored through appropriate phases to ensure a smooth transition to Cox Business Services. In addition, our services will be reviewed on an ongoing basis to ensure the OCFA receives every possible benefit from Cox Business Services.